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ETHANOL TAX INCENTIVES AND ISSUES

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ABSTRACT

This paper reviews the tax laws and incentives related to ethanol fuels derived from biomass. Both the Federal government and some states provide incentives for ethanol production, but the Federal incentives are by far the most important and are the focus of this investigation. A major finding of this paper is that the nominally quoted Federal ethanol tax incentive of 54 cents per gallon overstates the actual cost to the Federal government or the true ethanol subsidy, which is approximately 34 cents per gallon. Policy and decision makers should be aware of this difference when considering the costs and benefits of ethanol fuels. Based on median state tax rates, the Federal incentives produce an increase in state tax revenues of approximately 9 cents per gallon, resulting in a combined Federal/state subsidy value of about 25 cents per gallon. About 20 states provide tax incentives for ethanol fuels, and the subsidies associated with the combined Federal and state incentives are underestimated to that extent. As each of the 20 states has its own unique incentive structure, formulating a meaningful state-average incentive suitable for national application is not possible. However, examples of the combined Federal and state incentives for selected states are presented, and the net costs to the Federal and state governments are typically about 50 percent or less than the nominal incentive amounts.

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Executive Summary

To enhance domestic energy security and reduce toxic emissions associated with fossil fuels, Congress established several tax incentives to encourage the development and use of clean-burning, renewable fuels. Ethanol from biomass is recognized as one of the most promising technologies on the horizon, and this paper examines some of the tax incentives designed to promote the commercial maturation of an ethanol industry. The most important incentives are a partial exemption to the Federal motor fuels excise tax for gasohol, i.e., ethanol blends of 10 percent or less, (Table ES-1) and an income tax credit for ethanol used as a motor vehicle fuel (Table ES-2). Both incentives are nominally worth up to 54 cents per gallon of ethanol. The motor fuels tax exemption is typically more advantageous for ethanol used in gasohol, since the income tax credit is limited by the taxpayer's tax liability and is more complex to administer. For neat fuels, i.e., blends containing at least 85 percent ethanol, the excise tax exemption is between 5 and 6 cents, so the income tax credit is normally more advantageous. Most of the ethanol used today is blended into gasohol and only small amounts are used as neat fuels. The ethanol tax incentives expire in the year 2007,but on a schedule declining to 51 cents per gallon of ethanol.

Table ES-1. Federal Motor Fuels Excise Taxes for Gasoline and Ethanol Blends (Cents per Gallon)

Type of Fuel	Federal Motor Fuels Tax Rate	Exemption Rate per Gallon of Fuel (Compared to Gasoline)	Exemption-Rate Equivalent per Gallon of Ethanol
Gasoline	18.4	Not Applicable	Not Applicable
Gasohol, E10	13.0	5.4	54
Gasohol, E7.7	14.24	4.16	54
Gasohol, E5.7	15.32	3.08	54
E85 and above	12.95	5.45	6.41 (E85) to 5.4 (E100)

Table ES-2. Major Alcohol Fuels Income Tax Credit for Ethanol

Type of Alcohol Fuels Credit	Description	Maximum Credit Amount (Cents per Gallon)
Alcohol Mixture Credit	Alcohol blended with a qualifying motor fuel	54, for 190 proof and above 40, for 150 to 190 proof
Alcohol credit	Alcohol not mixed with gas or special fuel other than a denaturant	54, for 190 proof and above 40, for 150 to 190 proof

Note: The alcohol fuels income tax credit is subject to the general business tax credit limitations, must be reduced by any motor fuels excise tax exemption, and must be reported as gross revenue.

The nominally quoted Federal ethanol tax incentive of 54 cents per gallon overstates the actual cost to the Federal government or the true ethanol subsidy, which is shown below to be approximately 34 cents per gallon[1]. Policy and decision makers should be aware of this difference when considering the costs and benefits of ethanol fuels. Based on median state tax rates, the Federal incentives produce an increase in state tax revenues of approximately 9 cents per gallon, resulting in a net combined Federal/state subsidy value of about 25 cents per gallon. About 20 states provide tax incentives for ethanol fuels, and the subsidies associated with the combined Federal and state incentives are underestimated to that extent. As each of the 20 states has its own unique incentive structure, formulating a meaningful state-average incentive suitable for national application is not possible. However, combined Federal and state incentives for selected states were reviewed, and the net costs to the Federal and state governments are typically about 50 percent or less than the nominal incentive amounts.

The nominal incentive value overstates the true ethanol subsidy for several reasons. First, liquid motor fuel taxes are assessed volumetrically, but ethanol has only about two-thirds the energy content of gasoline for an equal volume. For the same miles driven, approximately 50 percent more ethanol is used by volume and, consequently, the tax receipts are 50 percent greater. This applies to both Federal and state taxes. Second, Internal Revenue Service (IRS) regulations treat the ethanol incentive as gross revenue, and it is taxed at the taxpayer's marginal tax rate. Table ES-3 summarizes the adjustments that must be made to determine the true cost of the incentive on the government's tax revenues. Other factors, which are not quantitatively estimated here, may further decrease the cost of the incentives to the government. In particular, ethanol production will displace some petroleum imports and consequently increase the domestic tax base.

[1]In this paper, the term tax incentive refers to the excise tax exemption or the tax credit available to a taxpayer, and the term subsidy refers to the actual cost to the government or the tax revenues forgone because of the incentives. The reader should bear this distinction in mind, as colloquially, the two terms are often used interchangeably.

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(Cents per Gallon)

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Total Federal Adjustment	19.6
Subsidy Net of Federal Adjustments	**34.4**
Parity Rate Adjustment for Median State Motor Fuel Tax (20 cents per gallon)	6.7
Typical State Income Tax Adjustment (0.05 Tax Rate Applied to Incentive)	2.7
Total State Adjustment	9.4
Subsidy Net of Federal and State Adjustments (Does Not Include State Incentives)	**25.0**

1. Introduction

To enhance domestic energy security and reduce toxic emissions associated with the combustion of fossil fuels, Congress established several tax incentives to encourage the development and use of clean-burning, renewable fuels. Ethanol from biomass is recognized as one of the most promising technologies on the horizon, and this paper examines some of the tax incentives designed to promote the commercial maturation of an ethanol industry.

The most important Federal incentives are a partial exemption from the gasoline excise tax and an income tax credit. The excise tax exemption is limited to specific ethanol blends, and for ethanol used in gasohol, it is equivalent to 54 cents per gallon of ethanol. The income tax credit applies to all ethanol blends and provides an allowable credit of 54 cents per gallon of ethanol. However, the Internal Revenue Code (IRC) subjects the income tax credit to a complex set of rules and regulations and a taxpayer may not be able to claim the full credit. When a taxpayer has a choice between taking the excise tax exemption or the income tax credit, the excise tax exemption is typically more advantageous. For neat fuels, i.e., blends containing at least 85 percent ethanol, the excise tax exemption is between 5 and 6 cents, so the income tax credit is normally more advantageous. Most of the ethanol used today is blended into gasohol and only small amounts are used as neat fuels. The ethanol tax incentives expire in the year 2007, but on a schedule declining to 51 cents per gallon of ethanol.

The nominally quoted Federal ethanol tax incentive of 54 cents per gallon overstates the actual cost to the Federal government or the true ethanol subsidy, which is approximately 34 cents per gallon[1]. Policy and decision makers should be aware of this difference when considering the costs and benefits of ethanol fuels. Based on median state tax rates, the Federal incentives produce an increase in state tax revenues of approximately 9 cents per gallon, resulting in a net combined Federal/state subsidy value of about 25 cents per gallon. About 20 states provide tax incentives for ethanol fuels, and the subsidies associated with the combined Federal and state incentives are underestimated to that extent. As each of the 20 states has its own unique incentive structure, formulating a meaningful state-average incentive suitable for national application is not possible. However, examples of the combined Federal and state incentives for selected states are given, and the net costs to the Federal and state governments are typically about 50 percent or less than the nominal incentive amounts.

The nominal incentive value overstates the true ethanol subsidy for several reasons. First, liquid motor fuel taxes are assessed volumetrically, but ethanol has only about two-thirds the energy content of gasoline for an equal volume. For the same miles driven, approximately 50 percent more ethanol is used by volume and, consequently, the tax receipts are 50 percent greater. This applies to both Federal and state taxes. Second, Internal Revenue Service (IRS) regulations effectively treat the ethanol incentive as gross revenue, and it is taxed at the taxpayer's marginal

[1]In this paper, the term tax incentive refers to the excise tax exemption or the tax credit available to a taxpayer, and the term subsidy refers to the net cost to the government or the tax revenues forgone because of the incentives. The reader should bear this distinction in mind, as colloquially, the two terms are often used interchangeably.

tax rate. Other factors, which are not quantitatively estimated in this paper, may further decrease the cost of the incentives to the government. In particular, ethanol production will displace some petroleum imports and consequently increase the domestic tax base.

Types of Subsidies

It is important to understand how different subsidy types are interpreted and applied. Three subsidy types are discussed below.

1. Net cost to the Federal government resulting from the Federal incentives

The net cost to the Federal government resulting from the Federal incentives is appropriate for use by Federal tax policy analysts, who are concerned primarily with the impact of the Federal incentive on the Federal budget. In particular, the net cost to the Federal government is applicable to the "pay-as-you-go" (PAYGO) provisions, which requires that any new legislation enacted through 2002 that increase the Federal deficit be offset with new legislation providing a corresponding decrease.

2. Combined net cost to the Federal and state governments resulting from the Federal incentives

The combined net cost to the Federal and state governments resulting from the Federal incentives is appropriate for cost-benefit analysis from a macroeconomic viewpoint, such as comparing costs and benefits of carbon avoidance, or when considering the net cost of the Federal incentive to society. Here the Federal incentives produce a net increase in state tax revenues, so this subsidy type can be thought of as the impact of the Federal incentive on the combined Federal and state government tax revenues. This subsidy type may be more appropriate for broader economic/political arguments than the subsidy type limited the impact on the Federal budget.

3. Combined net cost to the Federal and state governments resulting from both Federal and state incentives

The combined net cost to the Federal and state governments resulting from both Federal and state incentives is appropriate for macroeconomic types of analyses. The state incentives provide a marginal boost to the Federal incentives, but by themselves would not be sufficient to spur ethanol production, given current conditions. This subsidy type is also appropriate for cost benefit analysis, but being state specific, is difficult to apply on a national level.

Which subsidy type should be used depends on the context of the issue being addressed, and the user should be careful that the correct subsidy type is selected. This paper is sponsored by the Office of Fuels Development, which is promoting the large-scale commercialization of cellulosic ethanol production. Federal incentives will be necessary to encourage the private sector until

technological advances and economies of scale are sufficient to reduce ethanol production costs. Although some state incentives are likely, at least initially, they are expected to be relatively small compared with any Federal incentives. Consequently, the emphasis in this paper is on the Federal incentives or subsidy type one and two.

Organization

Section 2 discusses the Federal tax incentives for ethanol fuels. Section 3 presents a list of current state incentives. Section 4 provides an analysis of the real cost of the incentives to the government and presents an estimate of the true ethanol subsidy. This section also presents examples of combined Federal and state incentives for selected states. Section 5 presents the conclusions and areas requiring additional research.

Terminology

Gasohol is a mixture of gasoline and ethanol and originally referred to a blend of 10 percent ethanol and 90 percent gasoline. At first, Congress granted an excise tax exemption equivalent to 54 cents per gallon of ethanol only to the 10 percent gasohol mixture. Congress later granted the 54-cent-equivalent exemption to blends of 7.7 and 5.7 percent ethanol, corresponding to oxygenate level restrictions in certain geographic areas. With this change, gasohol now refers to blends of 10 percent or less ethanol. Neat fuels refer to blends that are at least 85 percent ethanol. For an arbitrary blend level, the designator EXX, where XX is the ethanol percentage, is commonly used.

2. Federal Tax Incentives

Congress enacted several tax incentives to encourage the production and use of biomass-derived ethanol. The two most important incentives are a partial exemption to the gasoline excise tax and an alcohol fuels tax credit. To prevent double dipping, the alcohol fuels tax credit must be reduced by any gasoline excise tax exemption taken.

Most of the incentives for alcohol fuels do not apply to alcohol produced from petroleum, natural gas, or coal, effectively limiting the application to alcohol produced from biomass. A few tax incentives are not as restrictive as to the type of feedstock, but these incentives are relatively minor and apply primarily to methanol, which is not commercially derived from biomass at the current time. These incentives are not relevant to ethanol and are not discussed in this paper.

The motor fuels taxes for gasoline and ethanol blends are listed in Table 1. The tax per gallon of gasoline is 18.4 cents. Three gasohol blends, E10, E7.7, and E5.7, containing ethanol derived from biomass are granted partial excise tax exemptions, effectively lowering their tax rates. The partial exemption for E10 is 5.4 cents per gallon, for an effective tax rate of 13.0 cents per gallon. This is equivalent to an exemption of 54 cents per gallon of ethanol. Originally, the gasohol exemption applied only to E10, but Congress extended the exemptions to E7.7 and E5.7. The tax

rates for these two gasohol blends are derived proportionately (14.24 and 15.32 cents per gallon, respectively), so that the equivalent exemption per gallon of ethanol is also 54 cents. The tax on neat fuels, ethanol blends of 85 percent or greater, is slightly less than 13.0 cents per gallon because neat fuels enjoy an additional exemption of one-half of the leaking underground storage trust (LUST) fund, which was reintroduced as of October 1, 1997 at 0.1 cents per gallon. The current tax on neat fuels is 12.95 cents per gallon. However, the equivalent subsidy per gallon of ethanol for these blends is 5.4 cents per gallon for E100 and 6.41 for cents per gallon for E85, which is far less generous than for gasohol. The ethanol excise tax exemptions are in effect through September 30, 2007, but on a schedule declining to 51 cents per gallon.

The alcohol fuels tax credit is the sum of (i) the alcohol mixture credit, (ii) the alcohol credit, and (iii) the small producer ethanol credit (Table 2). The alcohol fuels tax credit applies to alcohol mixed with gasoline and used as a fuel, while the alcohol credit applies to alcohol that is not mixed with gasoline or special additives other than a denaturant and is used as a fuel. For ethanol, both of these credits are 54 cents per gallon. The small ethanol producer credit is 10 cents per gallon, but is limited to the 15 million gallons for producers that have an aggregate production capacity under 30 million gallons per year. This later credit is only of marginal importance and is not further considered in this paper. The alcohol fuels credit extends through 2007, but at a schedule declining to 51 cents per gallon.

Table 1. Rates of Excise Taxes, Excise Tax Exemptions, and Income Tax Credits for Selected Highway Motor Fuels

Motor fuel	Combined motor fuels excise tax rates (cents per gallon of fuel)[a]	Rates of exemption (cents per gallon of fuel)	Rates of exemption (cents per gallon of alcohol)[b]	Rates of alcohol fuels tax credits (cents per gallon of alcohol)[b,c]
Gasoline	18.4	0.0	N/A	N/A
Diesel fuel[d]	24.4	0.0	N/A	N/A
Gasohol from ethanol:				
At least 10-percent ethanol	13.0	5.4	54.0	54.0
At least 7.7-percent but less than 10-percent ethanol	14.24	4.16	54.0	54.0
At least 5.7-percent but less than 7.7-percent ethanol	15.32	3.08	54.0	54.0
Gasohol from methanol:				
At least 10-percent methanol	12.4	6.0	60.0	60.0
At least 7.7-percent but less than 10-percent methanol	13.78	4.62	60.0	60.0
At least 5.7-percent but less than 7.7-percent methanol	14.98	3.42	60.0	60.0
10-percent dieselhol from ethanol	19.0	5.4	54.0	54.0
10-percent dieselhol from methanol	18.4	6.0	60.0	60.0
Qualified ethanol fuels (at least 85-percent ethanol)from other than petroleum or natural gas	12.95	5.4	5.4 to 6.41	54.0
Qualified methanol fuels (at least 85-percent methanol)(other than ethanol)from other than petroleum or natural gas	12.4	6.0	6 to 7.06	60.0
Special motor fuels	18.4	0.0	0.0	[e]
Partially exempt methanol and ethanol fuels (at least 85-percent alcohol) from natural gas	9.25 11,4	9.15 7,0	10.76 8,24	N/A N/a

Legend: N/A = not applicable.

[a] The combined tax rates encompass the Highway Trust Fund taxes and the General Fund tax.

[b] The rates of exemptions and credits per gallon of alcohol as shown in the table are for blends that meet the minimum alcohol content percentage. Blends that have higher contents than the minimum for a given range receive a lower subsidy per gallon. For example, gasohol that is 6-percent ethanol receives a subsidy of 51.3 cents per gallon of alcohol. However, gasohol blenders will generally stick to the blend rates which provide the maximum tax exemption per gallon of alcohol.

[c] The credit rates shown are for alcohol fuels in which the alcohol is at least 190 proof; credit rates for proofs between 150 and 190 are lower. No credit is given for alcohol that is less than 150 proof. The credit rates shown do not include the credit for small ethanol producers.

[d] There is a lower rate of tax for diesel fuel used for intercity buses.

[e] Alcohol fuels that qualify as special fuels are eligible for the separate "alternative fuels production tax credit."

Sources: Internal Revenue Code, IRS Form 720 and instructions, and computations.

Table 2. Alcohol Fuels Income Tax Credit for Ethanol

Type of Alcohol Fuels Credit	Description	Maximum Credit Amount (Cents per Gallon)
Alcohol Mixture Credit	Alcohol blended with a qualifying motor fuel	54 cents for 190 proof and above 40 cents for 150 to 190 proof
Alcohol Credit	Alcohol not mixed with gas or special fuel other than a denaturant	54 cents for 190 proof and above 40 cents for 150 to 190 proof
Small Producer Credit	Production capacity must be less than 30 million gallons per year.	10 cents for up to 15 million gallons

Notes: (1) The alcohol fuels tax credit is subject to the general business tax credit limitations, must be reduced by any motor fuels excise tax exemption, and must be reported as gross revenue.
(2) The small producer credit applies primarily to niche markets and is of minimal importance. It is subject to aggregation rules.

The alcohol fuels credit can only be taken against the blender's[2] Federal tax liability at the end of the tax year and is subject to the general business tax restrictions, i.e., it applies only to a tax liability greater than certain other tax credits and the larger of 25 percent of the taxpayer's regular tax liability or $25,000 and the alternative minimum tax liability. The credit must be reduced by any motor fuel excise tax exemption taken. In addition, the allowable credit must be reported as gross income for the tax year in which the credit is earned even if the credit that can be taken that

[2]Usually the blender takes the alcohol mixture and alcohol credits, as the credits apply primarily to the person mixing the ethanol or dispensing it at the retail level. The producer will take any small producer credit.

year is less than the allowable credit[3]. If the blender taking the credit does not have a sufficient Federal tax liability, he cannot claim the full credit allowable for the tax year. The Internal Revenue Code provides a carryback and carryforward period for unused tax credits. However, the carryforward period for unused alcohol fuel credits is more limited than the standard carryforward period for general business tax credits[4].

When either the excise tax exemption or the income tax credit can be taken, the excise tax exemption is generally preferred by taxpayers[5]. The taxpayer always gets the benefit of the full excise tax exemption, whereas the taxpayer may have an insufficient tax liability to claim the entire tax credit allowable. Moreover, the full allowable tax credit must be reported as gross income and is taxed at the taxpayer's marginal rate, even if the taxpayer cannot take advantage of the full credit, which could reduce nominal value of the tax credit. The tax credit also imposes additional bookkeeping and tracking requirements, since the credit must be reduced by any excise tax exemptions, even if they are claimed by another taxpayer. To the taxpayer, the gasoline excise tax credit is immediate, whereas the income tax credit is taken at the end of the year (or when filing quarterly estimated tax payments) after the income tax liability is computed.

[3]Only two income tax credits must be reported as gross income: the alcohols fuels credit and the gasoline tax and special fuels credit. This later credit applies to tax credits taken for excise taxes paid for fuels used for farming, non-highway use, school buses, and other nontaxable purposes. Only the alcohol fuels credit has the additional requirement that the total credit allowable must be included as gross income, even if the taxpayer can not claim the full allowable credit. The unclaimed credit is subject to the carryback and carryforward rules.

[4]The carryforward period currently expires at the end of 2003. However, an earlier termination may occur if the Highway Trust fund financing rate under Code Sec. 4081 ceases to exist. In that case, the credit may not be carried forward to tax years beginning after the two tax years following the tax year in which the rate ceased to exist.

[5]The Treasury's position is that the tax credit provides the same benefit as the excise tax exemption, provided there is a sufficient tax liability. Treasury does note that some cost of money differences could arise depending on when the income tax credit is taken. This is especially true if some of the credit is carried over to future years. However as noted in the text, the income tax credit requires additional bookkeeping and tracking of the fuel to see if other taxpayers claim any excise tax credits. Currently, almost all ethanol is used in gasohol and almost all the ethanol incentives are claimed as excise tax credits.

Table 3. Excise Tax Exemption and Income Tax Credit Example
(dollars except where noted)

	Gasohol	E85	E70
Total number of gallons	100,000	10,000	10,000
Ethanol percent	10	85	70
Number of ethanol gallons	10,000	8,500	7,000
Potential income tax credit	5,400	4,590	3,789
Excise tax exemption per gallon of fuel	0.054	0.0545	0.00
Excise tax exemption for total fuel	5,400	545	0
Allowable income tax credit (potential credit minus excise tax exemption)	0	4,045	3,789
Income tax credit that must be reported as income	0	4,045	3,789

The equivalent 54 cents per gallon excise tax exemption for ethanol applies only to ethanol used in gasohol. The income tax credit applies to all ethanol blends as well as to ethyl tertiary butyl ether (ETBE). It also applies to some fuel that is not subject to motor fuel excise taxes, e.g., ethanol fuel used by an ethanol producer, and for which, of course, excise tax exemptions do not apply. For neat fuels, where the equivalent exemption per gallon of ethanol is in the 5- to 6-cent range, the taxpayer can take the excise tax exemption and claim the balance of the 54 cents per gallon as a tax credit. Table 3 illustrates typical tax calculations for gasohol (E10), E85, and E70. Although the E70 is entitled to a 5.4-cent-per-gallon exemption, because it exceeds the 10 percent ethanol requirement, the numbers in Table 4 illustrate a case where no exemption is claimed and all the tax benefit is taken as an income tax credit.

The ethanol tax incentives remain at an equivalent level of 54 cents per gallon of ethanol through 2000. Thereafter, the incentives on a gallon of ethanol basis are 53 cents in 2001, 52 cents in 2003 and 2004, and to 51 cents for 2005 through 2007.

3. State Tax Incentives

Approximately 20 states currently offer some sort of ethanol incentive, which may take the form of a blender credit, producer credit, income tax deduction, motor fuel tax excise tax exemption, or sales tax reduction. Whether the current state incentives will continue or whether additional states will provide incentives is speculative, especially if a large cellulosic ethanol industry emerges. Six states provide an exemption from the motor fuels tax for gasohol (Table 4). In four states, the exemption is a penny or two per gallon of gasohol, equivalent to 10 to 21 cents per gallon of ethanol, assuming a 10 percent ethanol blend. The excise tax exemption in Alaska is 8 cents per gallon for gasohol for ethanol produced from wood, which is equivalent to 80 cents per

gallon for ethanol. This is by far the largest incentive provided by any state. The Alaska excise tax exemption originally applied to all biomass ethanol, but in 1997 legislation was introduced to restrict the exemption to alcohol produced from wood. The outright blender/producer credits vary considerably from state to state, and range up to 40 cents per gallon of ethanol (Table 5). Some states, however, impose limits on the amount of funds available for ethanol incentives.

Table 4. State Motor-Fuel Tax Exemption for Gasohol as of November 1996

State	Exemption for Gasohol (Cents per Gallon of)	Equivalent Exemption for Ethanol (Cents per Gallon)
Alaska	8.0 Applies only to ethanol produced from wood	80 Applies only to ethanol produced from wood
Connecticut	1.0	10
Idaho	2.1	21
Iowa	1.0	10
Missouri	2.0	20
South Dakota	2.0	20

Source: U.S. Department of Transportation, Federal Highway Administration, "Monthly Motor Fuel reported by States", November 1996 and legislation enacted in Alaska during the first quarter of 1998.

Table 5. State Ethanol Incentives Other than Motor Fuel Tax Exemptions for Gasohol as of April 1997

State	Incentive
California	One-half of the gasoline fuel excise tax credit for E85. Neat fuels are exempt from fuel taxes. Current excise taxes for gasoline and E85 are 18 and 9 cents per gallon, respectively
Hawaii	Exempt from retail sale tax (4 percent)
Illinois	2 percent sales tax exemption
Indiana	10 percent income tax deduction for plants that upgrade
Minnesota	25 cents per gallon of ethanol, capped at $3.75 million per year for each producer
Missouri	20 cents per gallon of ethanol produced in state
Montana	30 cents per gallon of ethanol, $6 million cap on a first-come basis
Nebraska	25 cents per gallon of ethanol, capped at $25 million per year for each producer
North Carolina	Income tax credit up to 30 percent plant cost
North Dakota	40 cents per gallon of ethanol produced and sold within North Dakota, $3,675,000 authorized in 1995
Ohio	1 cent per gallon of E10 income tax credit, equivalent to 10 cents per gallon of ethanol, maximum of $15 million per year
Oregon	50 percent property tax credit for ethanol facilities
South Dakota	20 cents per gallon of ethanol produced in state, $208,667 funding cap
Washington	credit of 60 percent of tax rate for each gallon of alcohol blended
Wyoming	40 cents per gallon of ethanol, through 2000

Source: *Clean Cities Guide to Alternative Fuel Vehicle Incentives*, U.S. Department of Energy, November 1996 and *The Clean Fuels Report*, April 1997

4. Revenue Neutral Subsidies

The true cost of the ethanol subsidy is the difference between tax revenues received by the government with and without the ethanol incentives. The nominal value of the ethanol incentives, i.e., the excise tax excise exemptions and income tax credit, overstate the actual revenue loss. To estimate the true ethanol subsidy, the impact of the tax incentives on the government's overall revenue must be taken into account. The two most important and easily quantifiable factors that enter the equation are (i) the difference in the energy content between ethanol and gasoline and (ii) the increase in real income that is subject to income taxes. Other factors also play a role, but their effect is more difficult to quantify due to a lack of economic data.

Parity Tax Rates for Motor Vehicle Fuels

The excise taxes on liquid motor vehicle fuels are assessed volumetrically. Consequently, the government will receive more tax revenues for less efficient fuels than for more efficient fuels, as more gallons of the less efficient fuel will be consumed to drive the same miles. Since the number of miles obtainable per gallon of fuel is normally proportional to the energy content of the fuel, the energy content is commonly used for comparing relative driving efficiencies of different fuels.

Parity tax rates, or those rates which would provide the government with equal revenues, are useful for determining whether the statutory tax rates favor certain fuels. A fuel's parity rate with respect to gasoline is calculated by multiplying the gasoline tax rate (18.4 cents) by the ratio of the energy content of a given fuel to that of gasoline. The energy content per gallon of pure ethanol is about two-thirds that of gasoline,[6] so the parity tax rate for pure ethanol is two-thirds that of gasoline or 12.3 cents per gallon (18.4 x 2/3). The difference between the gasoline and ethanol tax rates, 6.1 cents per gallon, is a revenue-neutral adjustment for pure ethanol. Alternatively, if the excise tax rate for both gasoline and ethanol were both 18.4 cents per gallon, ethanol would be disadvantaged by 6.1 cents per gallon.[7]

To illustrate this concept with a simple numerical example, consider the case of a motorist that owns a flexible fuel car with a gasoline fuel economy rating of 20 miles per gallon. The motorist fills his tank with gasoline and leaves the gasoline filling station, driving 300 miles to the ethanol filling station. He uses 10 gallons of gasoline for the trip. At that point he fills his tank entirely with ethanol and retraces his 300 miles, using 15 gallons of ethanol. For the outgoing trip, the

[6]The BTU ratio between ethanol and gasoline is a good proxy for the ratio of the miles per gallon obtained from ethanol to that obtained from gasoline in today's cars. The energy contents of ethanol and gasoline are 75,670 and 115400 BTU, respectively. Engineers are working on improving driving efficiencies for dedicated neat-fueled vehicles by tailoring engine performance to ethanol usage. Estimates of an 8 to 10 percent increase in miles per gallon are claimed. The objective of this paper is to illustrate tax issues and numerical adjustment can be made once a new technology are demonstrated.

[7]On a parity or energy-content basis, the motor fuel excise rates subsidize gasohol, electricity, and compressed gas , and disadvantage propane, pure ethanol fuels, liquefied petroleum gas.

government collects $1.84 in excise taxes (10 gallons times 18.4 cents per gallon). If ethanol were taxed at the same rate as gasoline, the government would collect $2.76 in excise taxes (15 gallons times 18.4 cents per gallon). That is, the government would collect more money if the motorist decided to use ethanol instead of gasoline. For the government to be revenue neutral with respect to the choice of fuel, the ethanol tax should be 12.3 cents per gallon ($1.84 divided by 15).

The parity tax rate for ethanol blends can be computed by either multiplying the relative energy content of a gallon of the blend by 18.4 cents or, equivalently, summing the parity tax rates of each of the blend components. The calculation for E10 is illustrated below.

> First method: The energy ratio of a gallon of E10 to a gallon of gasoline is 0.9667 (0.90, for the gasoline content plus 0.10 x 2/3, for the ethanol content). The tax rate that would put E10 on parity with gasoline is 17.769 cents per gallon of E10 ($0.184 x 0.9667).
>
> Second method: The parity tax rate on the gasoline portion of E10 is 16.56 cents (0.90 x 18.4) and the parity tax rate on the ethanol portion of E10 is 1.23 cents (0.10 x 12.3). Adding the parity tax rates for the two components gives a parity tax rate of 17.79 cents per gallon of E10.

Table 6 lists the parity tax rates for the three gasohol blends entitled to the full 54 cents per gallon of ethanol exemption and for the neat fuels, E85 and E100. The parity tax rates are computed by the first method and the table displays the energy ratio of the fuel blend with respect to gasoline for the reader's convenience. The parity incentive is the difference between the excise tax rate and the parity rate. As can be seen from the last line in the table, the difference between the exemption rate and the parity incentive rate is 6.1 cents per gallon of ethanol, which is the same as the revenue-neutral adjustment for pure ethanol fuels discussed above. The equivalent parity incentive for the gasohol blends is 47.9 cents per gallon of ethanol or 6.1 cents less than the 54 cents per gallon equivalent exemption rate. For neat fuels, the parity incentive is virtually nonexistent, E100 is actually disadvantaged by 0.7 cents per gallon under the current excise tax rate structure.

Table 6. Parity Tax Rates and Comparison of Excise Tax Exemptions and Parity Incentives (Cents per Gallon, Except Where Stated)

Fuel Blend	E5.7	E7.7	E10	E85	E100
Percent Ethanol	5.7	7.7	10	85	100
Gasoline Tax Rate	18.4	18.4	18.4	18.4	18.4
Excise Tax Rate per Gallon of Fuel	15.32	14.24	13.00	13.00	13.00
Rate of Excise Tax Exemption per Gallon of Fuel	3.08	4.16	5.40	5.40	5.40
Equivalent Rate of Exemption per Gallon of Ethanol	54.04	54.03	54.00	6.35	5.40
Energy Ratio with Respect to Gasoline	0.9810	0.9743	0.9667	0.7167	0.6667
Parity Tax Rate per Gallon of Fuel	18.05	17.93	17.79	13.19	12.30
Parity Incentive per Gallon of Fuel	2.73	3.69	4.79	0.22	-0.70
Equivalent Parity Incentive per Gallon of Ethanol	47.94	47.93	47.90	0.26	-0.70
Difference Between Exemption Rate and Parity Incentive per Gallon of Ethanol	6.1	6.1	6.1	6.1	6.1

Often in the literature, effective tax rates are stated in terms of gasoline-equivalent gallons, which is the quantity of fuel that will provide the same number of BTU's as a gallon of gasoline. As an example, to calculate the volume of E10 that has the same energy content as a gallon of gasoline, divide the energy content of a gallon of gasoline by that of a gallon of E10, which yields 1.0345 gallons (1 / 0.9667). This makes the tax on a gasoline-equivalent gallon of E10 equal to 13.45 cents, which is collected on 1.0345 gallons of E10 . Since this paper is concerned with taxes per gallon of E10, as opposed to gasoline equivalent gallons, parity tax rates are used.

Differences in the energy contents of gasoline and ethanol also affect state tax revenues. An analysis of state tax issues, however, is complicated by the large variance in motor fuel tax rates among states (from 4 to 39 cents per gallon) and by the fact that about 20 states currently provide some form of ethanol incentives. The median state gasoline tax rate is 20 cents per gallon, with most state gasoline tax rates in the 15 to 25 cents per gallon range. Florida has the lowest state gasoline tax rate at 4 cents per gallon and Connecticut has the highest at 39 cents per gallon[8]. Some states may also impose other taxes such as a retail sales tax.

Using 20 cents per gallon as a rough estimate of state gasoline taxes, results in an additional revenue of 6.7 cents per gallon for ethanol if, as in most states, no exemption is granted to ethanol fuels. This suggests that ethanol is disadvantaged under many state tax structures. A thorough analysis of this issue would entail a state-by-state examination of motor fuel taxes and ethanol

[8]"Transportation Energy Databook, Edition 17", ORNL-6919, Oak Ridge National Laboratory, August 1997, Table 5.16

incentives. While this could easily be done for most states, aggregating the data to a useful national figure would encompass estimating ethanol usage and production by state. Nonetheless, the majority of the states do not offer ethanol incentives, and ethanol is clearly disadvantaged by their excise tax policies.

An argument could be made that a per gallon tax for ethanol should be revenue neutral for combined Federal and state motor fuel taxes. If this were the case, combining a revenue-neutral Federal tax exemption of 6.1 cents per gallon of ethanol with a revenue-neutral state tax exemption of approximately 6.7 cents per gallon (based on the median 20 cents per gallon state gasoline tax), results in a combined revenue-neutral exemption of 12.8 cents per gallon. It should be emphasized that the state-level figures are a rough approximation.

Effect of Income Taxes

Both ethanol incentives, the excise tax exemption and the income tax credit, are effectively included in gross income and are subject to Federal and state income taxes. The income tax receipts reduce the net cost of the incentives to the government and must be taken into account when estimating the real cost of the ethanol subsidy. Why the two incentives are included in gross income depends on whether the incentive is an excise tax exemption or an income tax credit. The reasons are discussed separately below.

The most accurate way to estimate the difference in real income that would occur with and without an excise tax in place requires estimating real income that would occur with and without the excise tax separately. This approach is impractical for the ethanol incentives due to the many interactions with other elements of the economy[9]. A reasonable argument can be made, however, that the excise tax exemption is essentially a transfer of funds from government's excise tax revenues to the gross income of the producers and sellers of ethanol. If the excise tax is removed and the price of the commodity remains the same, the seller gets the benefit of the removed tax.[10] Stated another way, an excise tax is effectively incorporated in the transaction price of a commodity. Following a similar type of reasoning, the Joint Committee on Taxation and the Treasury have adopted a convention to estimate the gross loss (gain) in Federal income tax revenues as 25 percent of the excise tax imposed (foregone). The 25 percent figure represents the average marginal income tax rate. A GAO report on alcohol fuels tax incentives contains the following explanation:

[9]Ethanol demand is affected by the level of the incentive. Corn is currently the main feedstock for biomass ethanol and any analysis would have to consider the impact of changes the demand for corn on the agricultural markets. Ethanol substitutes for petroleum and other special fuels, and changes in demand and prices of these items would also have to be considered.

[10]That the selling price will not change is a simplifying assumption. According to economic theory, an excise tax will alter the selling price and both the buyer and seller share the price increase.

When the Joint Committee on Taxation produces revenue estimates for an existing or proposed tax law provision, it assumes that the adoption or elimination of the provision will not affect aggregate economic variables, such as the gross domestic product (GDP), total employment, and the overall price index. The Joint Committee on Taxation expects that the imposition of an excise tax would raise the prices of the taxed goods and, thereby, increase nominal GDP by the amount of tax collected. However, to maintain its assumption that GDP remains fixed, the Joint Committee on Taxation assumes that aggregate income would fall by an amount equal to the excise tax collected so as to offset the tax-induced increase in GDP. This decline in income would reduce income tax receipts by an amount equal to the excise tax collected multiplied by the average marginal income and payroll tax rate on all income. The average marginal income tax rate is assumed to be about 25 percent. Therefore, the Joint Committee on Taxation estimates that the excise tax's net effect on Federal revenues would be equal to only 75 percent of the amount of excise tax collected. (See Congressional Budget Office, Budget Estimates: Current Practices and Alternative Approaches, Jan. 1995 and Bruce F. Davie, "Tax Expenditure in the Federal Excise Tax System," National Tax Journal, Vol. XLVII, No. 1, Mar. 1994, pp. 39-62), and Joint Committee on Taxation, Discussion of Revenue Estimation Methodology and Process (JCS-14-92), August 13, 1992.[11]

For the income tax credit, the Internal Revenue code requires that the allowable alcohol fuels tax credit must be reported as gross incomer. This rather unusual requirement applies only to the two general business credit categories that have a relationship with motor fuel excise taxes[12]. The rationale for this requirement is related to the way income taxes are computed. The alcohol fuels tax credit is considered as an alternative or substitute for the excise tax exemption and the government wants to receive the same income tax revenues whether the excise tax exemption or the income tax credit is claimed. In the latter case, the taxpayer receives a deduction for the excise tax paid, while in the former case no excise tax is paid and therefore is there is no deduction. Consequently, the net revenues are different between the two cases without the inclusion of the income tax credit as gross revenue. The inclusion of the income tax credit as gross revenue counterbalances the excise tax deduction and equalizes the gross revenues between the two cases. The following paragraphs present numerical examples to illustrate this concept. A more qualitative explanation along the lines of the discussion in the preceding paragraph is: the general assumption is that the exemption will show up as real income, consequently the same should be true of the income tax credit.

The following example illustrates the rationale for requiring the tax credit to be reported as gross income. Assume a producer produces a gallon of ethanol at a cost of 94 cents. Excise tax exemption case: The producer sells the gallon of ethanol for 104 cents and has a profit of 10 cents subject to income taxes. The buyer pays 104 cents for the gallon of ethanol. However, the buyer claims an excise tax exemption of 54 cents, and the government forgoes 54 cents in excise tax revenue. Income Tax credit case: This time the producer[13] is going to claim a 54-cent income tax credit, so he sells the ethanol for 50 cents. With the 54-cent tax credit, the producer still receives

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[11] *Tax Policy: Effects of the Alcohol Fuels Tax Incentives* ,03/06/97, GAO/GGD-97-41

[12] The other category is the gasoline tax credit, where any credit taken for gasoline excise taxes must included as gross income.

[13] Normally it is the blender or retailer that claims the excise tax exemption or the income tax credit, but the example is easier to understand if the income tax credit is associated with the producer.

104 cents. If the producer were not required to report the tax credit as income, the producer would report only the 50-cent sale price as income. The producer's cost is still 94 cents, and consequently the producer has a 44-cent tax loss. The government forgoes the 54 cents in income tax revenue, similar to the previous case. However, the taxable income is different between the two cases. The excise exemption case resulted in a 10-cent profit for income taxes and the tax credit case resulted in a 44-cent loss. Reporting the tax credit as income equalizes the two cases.

The amount that must be reported as gross income is the credit allowable, not the credit taken. Allowable means the credit as computed without regard to tax liability limitations. For example the allowable credit could be $5,400 (based on 10,000 gallons), but because of tax liability limitations only a $2,000 credit can be claimed for the year. Nonetheless, the taxpayer must report $5,400 as gross income, which, of course, reduces the value of the tax credit.

Table 7 presents a detailed comparison of income tax revenues for different excise tax exemption and income tax credit cases. The top half of the table shows the company's income statement, while the bottom half shows amounts subject to income taxes from the government's viewpoint. In all cases, the revenues are $174. In the first case, costs are low ($100) and no exemptions or credits are claimed. The company pays $54 in excise taxes and has a net income of $20. The government receives income taxes on the company's $20 profit. However, the government also receives income taxes on the costs of $100 incurred by the company since they become worker wages and profits to vendors. The government collects income taxes on the company's costs of $124. The government does not receive income taxes on the $54 excise tax paid by the company.

The second, third and fourth cases illustrate an excise tax exemption case with high costs, an excise tax exemption case with moderate costs, and an income tax credit case with high costs. In all three cases the same amount, $174, is subject to income taxes. In the second case, the costs are $154 and no excise taxes are paid. The company has a profit of $20 which is subject to income taxes. The government also collects income taxes on the company's costs of $154. In total, the government collects income taxes on the company's costs of $174. In the third case, the company's costs are lower and no excise taxes are paid. The costs are $124 and the company has a higher profit of $50 which is subject to income taxes. The government also collects income taxes on the company's costs of $124. In total, the government collects income taxes on the company's costs of $174. In the fourth case, the income tax credit is taken and the excise tax is paid. The $54 income tax credit must be reported as gross income and the company gets a deduction of $54 for the excise taxes paid. This leaves the company with a profit of $20 which is subject to income taxes. The government also collects income taxes on the company's costs of $154. In total, the government collects income taxes on the company's costs of $174.

Table 7. Comparison of Income Tax Revenues for Different Excise Tax Exemption and Income Tax Credit Cases

		! Pay Excise Taxes ! Low Costs	! Excise Tax Exemption ! High Costs	! Excise Tax Exemption ! Moderate Costs	! Income Tax Credit ! Pay Excise Tax ! High Costs
	Company Income Statement (dollars)				
1	**Revenue**	174	174	174	174
2	**Income Tax Credit**	Not Applicable	Not Applicable	Not Applicable	(IRS requirement) 54
3	**Gross Income (1+2)**	174	174	174	228
4	**Costs**	100	154	124	154
5	**Excise Tax**	54	0	0	54
6	**Total Expenses (4+5)**	154	154	124	208
7	**Net Income (3-6)**	20	20	50	20
8	**Income Tax Credit**	0	0	0	54 Assuming sufficient tax liability
	Amounts Subject to Income Taxes from Government's IRS Viewpoint (dollars)				
9	**Company Profit (7)**	20	20	50	20
10	**Costs in the Form of Wages and Vendor Profits, etc. (4)**	100	154	124	154

11	**Total Amount Subject to Income Taxes (9+10)**	120	174	174	174

Other Factors Affecting the Revenues Associated with Ethanol Incentives

Each gallon of ethanol used displaces a quantity of gasoline or other special fuel such as methyl tertiary butyl ether (MTBE). The displaced fuel may be of domestic or foreign origin. If it is of domestic origin, the fuel itself may be subject to special tax incentives such as the oil depletion allowance. To that extent, the ethanol subsidy should be reduced by this amount, since the revenues forgone by government are the same in either case. If the displaced fuel is of foreign origin, the government would receive additional income tax revenues because ethanol production is a domestic activity. Quantifying the impact of these factors is difficult because of lack of data.

Quantifying the Subsidy Level

As discussed in Chapter 1, a subsidy value can be computed for each of the three subsidy type listed below:

1. Net cost to the Federal government resulting from the Federal incentives
2. Combined net cost to the Federal and state governments resulting from the Federal incentives
3. Combined net cost to the Federal and state governments resulting from both Federal and state incentives

Table 8 presents the adjustments that must be made to the Federal ethanol incentives to arrive at the cost to the government or the true ethanol subsidy. Both the parity rate adjustments and the income tax adjustments are shown for subsidy types one and two. The first subsidy type contains only adjustments made for the Federal government, resulting in a subsidy of approximately 35 cents per gallon of ethanol for a nominal incentive of 54 cents per gallon. The second subsidy type combines revenue adjustments for both the Federal and state governments resulting from the Federal tax incentives. The state revenue adjustments are based on a median motor fuels excise tax rate of 20 cents per gallon and a typical state income tax of 5 percent. These assumptions are an attempt to approximate national average and are not representative of any state in particular.

Some states provide ethanol incentives and the cost of these incentives are not included in the "subsidy net of Federal and state adjustments" calculation, and so the combined Federal and state subsidy is underestimated to that extent. Due to the small number of

states that offer significant state-level incentives for ethanol, no national-aggregate state-level subsidy can be meaningfully inferred. However, for completeness, the following section presents analyses of combined Federal and state incentives for select states. Whether a large-scale cellulosic ethanol industry will significantly benefit from state incentives is uncertain, especially if the potential costs of the programs become very high. Indeed, some states currently have caps that limit the total benefits payable for ethanol incentives.

Table 8. Computation of Ethanol Subsidies for Federal Tax Incentives
Cents per Gallon

Federal Incentive (Excise Tax Exemption or Income tax Credit)	54
Parity Rate Adjustment for Federal Excise Tax	6.1
Federal Income Tax Adjustment (0.25 Tax Rate Applied to Incentive)	13.5
Total Federal Adjustment	19.6
Subsidy Net of Federal Adjustments	**34.4**
Parity Rate Adjustment for Median State Motor Fuel Tax (20 cents per gallon)	6.7
Typical State Income Tax Adjustment (0.05 Tax Rate Applied to Incentive)	2.7
Total State Adjustment (Increases in State Revenues)	9.4
Subsidy Net of Federal and State Adjustments (Does Not Include State Incentives)	**25.0**

State-Specific Examples

Table 9 displays subsidy calculations for combined Federal and state excise tax exemptions. Iowa and Tennessee are ethanol producing and consuming states. Connecticut is a special case as it has the highest motor fuels excise taxes, but is one of only a few states that provides a partial excise-tax exemption for gasohol. The parity adjustment for the state excise taxes almost compensates for the equivalent 10-cent-a-gallon ethanol exemption. Connecticut is not a major user of ethanol. Even though most states impose a state

sales tax on motor fuels, state sales taxes were not included in the analysis presented in this paper. Since state sales taxes are typically in the 5 percent range, they would increase the state parity adjustment by approximately 2 cents or decrease the combined Federal and state subsidy by approximately 2 cents.

Table 9. Computation of Combined Federal and State Ethanol Subsidies for Gasohol Upon Motor Fuels Excise Taxes (Cents per Gallon)

	Tennessee	Iowa	Connecticut
Federal Incentive (Excise Tax Exemption)	54	54	54
State Incentive (Excise Tax Exemption)	0	10	10
Total Incentive	**54**	**64**	**64**
Parity Rate Adjustment for Federal Excise Tax	6.1	6.1	6.1
Federal Income Tax Adjustment (0.25 Tax Rate Applied to Incentive)	13.5	16.0	16.0
Total Federal Adjustment	19.6	22.1	22.1
Subsidy Net of Federal Adjustments	**34.4**	**41.9**	**41.9**
State Gasoline Excise tax	20	20	39
Parity Rate Adjustment for State Motor Fuel Tax	6.7	6.7	13.0
Typical State Income Tax Adjustment (0.05 Tax Rate Applied to Incentive)	2.7	3.2	3.2
Total State Adjustment	9.4	9.9	15.2

	Tennessee	Iowa	Connecticut
Federal Incentive (Excise Tax Exemption)	54	54	54
State Incentive (Excise Tax Exemption)	0	10	10
Subsidy Net of Federal and State Adjustments	**25.0**	**32.0**	**26.7**

As noted earlier, an analysis of state incentives is more complicated than the analysis for Federal incentives, since many state incentives have funding authorization caps. Consequently, the average incentive per gallon of ethanol will depend on the total ethanol production within the state. If ethanol capacity increased and the funding cap remained fixed, the per-gallon incentive would decrease. In a year with normal corn prices, ethanol production is typically 90 to 95 percent of capacity, therefore capacity serves as a reasonable proxy for production in the following examples.
Nebraska has an incentive of 25 cents per gallon with a $25 million cap. Ethanol capacity in Nebraska is 114 million gallons per year, making the incentive per gallon of capacity about 22 cents per gallon, or almost 25 cents per gallon. Minnesota has a 25 cent per gallon incentive with a $3.75 million funding cap. Ethanol capacity in Minnesota is 23.6 million gallons per year, making the incentive per gallon of capacity about 16 cents per gallon. State producer incentives are often implemented through state tax credits, and because state income taxes are a deductible expense for Federal income taxes, the credits are subject to Federal income taxes. Since they are state tax credits, they are not subject to state taxes. Table 10 presents the subsidy calculations for Nebraska and Minnesota.

In general, these producer incentives are meant to encourage an emerging industry in the state, not to subsidize a large-scale industry. The states look at these incentives as a type of investment and expect to get additional tax revenues from the development of a new industry and increased employment. A further incentive in the agricultural Midwest states is to increase the demand for their farm products, particularly corn and soybeans in the case of ethanol. As part of the corn crop is diverted for ethanol use, the demand for soybeans, a somewhat interchangeable animal feed, is also increased. Consequently, the price of these crops increases, farmer income increases, and state tax revenues increase. Analysis of these issues is not within the scope of this paper. However, they are noted here to point out the difficulty of assessing the true cost to an individual state.

Table 10. Computation of Combined Federal and State Ethanol Subsidies for Gasohol Based for Select States Granting Income Tax Credits (Cents per Gallon)

	Minnesota	Nebraska
Federal Incentive (Excise Tax Exemption)	54	54
State Incentive (Income Tax Credit)	16 (Funding Cap Limited)	25
Total Incentive	**68**	**79**
Parity Rate Adjustment for Federal Excise Tax	6.1	6.1
Federal Income Tax Adjustment (0.25 Tax Rate Applied to Incentive)	17.0	19.8
Total Federal Adjustment	23.1	25.9
Subsidy Net of Federal Adjustments	**44.9**	**53.1**
State Gasoline Excise tax	20	25.3
Parity Rate Adjustment for State Motor Fuel Tax	6.7	8.4
Typical State Income Tax Adjustment (0.05 Tax Rate Applied to Federal Excise Tax Exemption Incentive of 54 cents)	2.7	2.7
Total State Adjustment	9.4	11.1

	Minnesota	Nebraska
Federal Incentive (Excise Tax Exemption)	54	54
State Incentive (Income Tax Credit)	16 (Funding Cap Limited)	25
Subsidy Net of Federal and State Adjustments	**35.5**	**42.0**

5. Conclusions and Suggestions for Further Research

When assessing the potential market penetration of ethanol fuels, the incentives and the true cost to the government or the subsidy play different roles. The incentive value is a key factor in the marketplace. It reduces the cost of ethanol and allows it to compete with other motor fuels. The subsidy, on the other hand, should be used for public cost-benefit analyses. The benefits from domestic ethanol production include reductions in greenhouse gas emissions; reductions in automotive emissions; displacement of petroleum, MTBE, and other motor fuels' jobs creation; and energy security. The value of these benefits should be compared with the true subsidy value, not the nominal incentive value.

The rest of this section presents several areas requiring additional research.

Incentive Sharing

The purpose of the Federal incentive is to provide an offsetting credit to the production cost of ethanol. However, it is usually the blender or retailer that claims the excise tax exemption or income tax credit. Consequently, the incentive is shared among the blenders, retailers, producers, and perhaps the consumers. Economic theory says the incentive is shared between the buyer and seller according to the relative elasticities of the demand and supply curves. How the ethanol incentives are shared between the producers and blenders/retailers can affect the demand for ethanol. The Oak Ridge National Laboratory (ORNL) Refinery Yield Model (RYM) has

been used to estimate an ethanol demand curve to the refinery, via a parametric analysis of refinery ethanol demand at varying ethanol price levels. The ethanol price the refinery sees is the ethanol production price less the producer's share of the ethanol incentive. Consequently, the greater the producer's share of the incentive, the lower the ethanol prices will be to the refinery, and the greater the demand for ethanol will be.

Neat Fuels and Non-gasohol Blends

Although a small excise tax credit exists for neat fuels, the primary incentive for neat fuels and non-gasohol blends is the alcohol fuels (income) tax credit. However, the taxpayer may not be able to get the full benefit of the alcohol fuels tax credit due to an insufficient tax liability. In addition, the full allowable alcohol fuels tax credit must be reported as income. The extent to which this limitation will reduce the value of the tax incentive is unknown. To keep this issue in perspective, it should be noted that the neat fuel market is relatively small at the present time.

State Incentives

State incentives will play a major role in siting any new ethanol facilities until technological advances sufficiently reduce production costs. This is particularly important for near-term plants, and state incentives should play a role in determining the supply-demand clearing prices.